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THE HUDSON RIVER DESCRIBED BY WILLIAM MORRIS
DAVIS,

FOR THE EXCURSION UP THE HUDSON RIVER,

ARRANGED BY THE AMERICAN GEOGRAPHICAL SOCIETY,

THURSDAY, SEPTEMBER 15th, 1904,

for the foreign delegates to the Eighth International Geographic Congress.

Like the lower Potomac, the Hudson below Albany is not a normal river; its volume is not determined by the amount of rainfall upon its drainage basin, but by the depth at which its bed stands beneath sea-level. Its broadest part, from 23 to 35 miles north of the Battery (southern end of New York City), is about 3 miles across. On the eastern side of the lower river rise the uplands of schists and gneisses, their height gradually increasing northward. These crystalline rocks belong to the belt of the older Appalachians, stretching from New England to Georgia. They have been greatly deformed and eroded. On the western side of the lower river rises a bold escarpment known as the Palisades, the outcropping edge of a sheet of diabase that has been intruded between the layers near the base of the Triassic formation, which here dips westward. The unconformable contact of the Trias on the schists is in the river-bed. The Hudson Valley in this district follows the weak basal Triassic sandstones between the crystalline uplands and the Palisades.

Like the eastern uplands, the Palisades increase in height northwards and reach an altitude of 832 feet in High Tor, back of Haverstraw. Here the Palisades ridge turns westward and recedes from the river. Extensive beds of clay, probably of Post-glacial Age, are here worked for brickmaking. North of Haverstraw, crystalline schists are found on both sides of the river from Peekskill to Cornwall (12 miles). Here the river is less than a mile wide, and the hills, rising to altitudes of from 1,000 to 1,500 feet, are called the Highlands of the Hudson. They continue with similar altitude far northeast into New England and southwest across New Jersey into Pennsylvania.

Beyond Cornwall the river again widens, and the Highlands are replaced by a broad lowland, beneath which the river has eroded its course. This lowland is a part of the Great Appalachian valley, which follows the lower Paleozoic limestones and shales from Lake

Champlain southwest to Alabama. On landing at Fishkill on the east bank, ascent is made by trolley and elevator cars to Mt. Beacon, one of the summits of the Highlands, 1,835 feet above the river. The eastern escarpment of the Catskill Mountains (the northeastern part of the Allegheny plateau) may be seen to the northwest.

The relatively uniform increase in hilltop altitude from New York to the Highlands suggests that the valleys of to-day have been eroded in a formerly nearly even surface or plain, descending southward, or southeastward. The plain runs indifferently across the rock structures of the region; hence it must be considered an ancient peneplain, the product of long-continued erosion when the land stood lower than now. Certain Cretaceous strata overlap the peneplain in Long Island and farther south; hence the peneplain may be regarded as produced by erosion in Jurassic and Cretaceous time.

The valleys of to-day can have been eroded only after the peneplain was uplifted to about its present altitude. Their erosion was accomplished in part of Tertiary time. Where the valleys have little depth the uplift of the peneplain must have been small; where the valleys have great depth, the uplift must have been strong. Where the rocks resist erosion, the valleys are narrow, as in the gorge through the Highlands; where the rocks are weak, the valleys are wide, as in the Great Appalachian valley.

Closer inspection shows that the Hudson occupies a trench that is eroded some 300 feet below the general floor of the Great Appalachian valley; hence there must have been a pause in the uplift of the peneplain, and this pause must have endured long enough for the erosion of most of the existing valleys; only at a relatively recent date did further uplift take place, for the trench in the great valley floor is much narrower than the Great Valley itself.

All this region has been glaciated, but it is difficult to give definite measure of the value of glacial erosion; it is believed to have been of moderate amount. Glacial drift is abundant on the lower land.

The present depth of the Hudson River bed below sea-level has ordinarily been explained by a depression of the land; but since it has been recognized that glaciers can erode below sea-level, it is difficult to say how much of the depth of the channel is due to depression of the land and how much to erosion by ice.

The extension of a navigable tide-water channel nearly 150 miles northward up the Hudson to Albany, and the opening of the Mo-

hawk valley west of Albany, between the Catskill (Helderberg) and the Adirondack Mountains has made communication easy between the harbor of New York and the prairies of the west. The contrast between the Hudson and the Potomac in this respect is very striking. The gorge of the Highlands is therefore a path of most active traffic, by rail (N. Y. Central R.R. on the east bank, West Shore R.R. on the west bank) as well as by boat; and New York is for this reason the commercial metropolis of the United States.

GAUSSBERG IN THE ANTARCTIC.

This picture of the isolated mountain discovered by the German Antarctic Expedition at the northern edge of the new land found by the party is selected from the illustrations accompanying Dr. Drygalski's report published in the *Zeitschrift* of the Berlin Geographical Society (No. 1, 1904). The land on which it stands was discovered on Feb. 21, 1902, and the next day the exploring vessel *Gauss* was frozen in the ice about forty-five miles north of the coast. The party were imprisoned here for nearly a year until Feb. 8, 1903, their position being Latitude 66° 30' S., Longitude 90° E.

Gaussberg, as Dr. Drygalski named the mountain, rises from the sea edge to a height of 1,200 feet, and is of volcanic formation. The photographer, in taking this picture, stood on the inland ice to the southwest of the mountain, and the picture shows its southern face. Most of the side of the eminence is seen to be covered with snow, though wide streaks of the black lavas are in view. The northern face of the mountain, however, which confronted the sledge parties as they travelled from their ship to the land, showed only little patches of snow, the black block of lava contrasting strongly with the white sea-ice in front of it. Though the mountain was partly covered with snow, it was free from ice, and was the only bit of ice-free land seen by the Expedition.

Five months were spent in the sledging expeditions to the land, the objective points being the mountain and the seaboard, where scientific investigations, extending over weeks at a time, were carried on. It was difficult to reach the mountain, as the distance from the ship was forty-six miles over rough sea-ice. It would have been much easier, after gaining the land, to travel southward over the inland ice that covered it; but the explorers saw no purpose to be gained from such a journey, as they could see from the summit